

Translation

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 2001P23526WO	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/EP2003/009569	International filing date (day/month/year) 28 August 2003 (28.08.2003)	Priority date (day/month/year) 10 September 2002 (10.09.2002)
International Patent Classification (IPC) or national classification and IPC F22B 1/18		
Applicant SIEMENS AKTIENGESELLSCHAFT et al.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 8 sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

a. ☐ (sent to the applicant and to the International Bureau) a total of _____ sheets, as follows:

☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒ Box No. I Basis of the report

☐ Box No. II Priority

☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

☐ Box No. IV Lack of unity of invention

☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

☐ Box No. VI Certain documents cited

☐ Box No. VII Certain defects in the international application

☐ Box No. VIII Certain observations on the international application

Date of submission of the demand 21 January 2004 (21.01.2004)	Date of completion of this report 27 December 2004 (27.12.2004)
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

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Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language _____, which is language of a translation furnished for the purpose of:

- ☐ international search (under Rules 12.3 and 23.1(b))
☐ publication of the international application (under Rule 12.4)
☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☒ The international application as originally filed/furnished

☒ the description:

pages _____ 1-23 _____, as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☒ the claims:

pages _____ 1-13 _____, as originally filed/furnished

pages* _____, as amended (together with any statement) under Article 19

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☒ the drawings:

pages _____ 1/5-5/5 _____, as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing (*specify*): _____

☐ any table(s) related to sequence listing (*specify*): _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing (*specify*): _____

☐ any table(s) related to sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

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V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-13	YES
	Claims		NO
Inventive step (IS)	Claims	1-3	YES
	Claims	4-13	NO
Industrial applicability (IA)	Claims	1-13	YES
	Claims		NO

2. Citations and explanations

Reference is made to the following documents:

D1: EP-A-0 944 801 (SIEMENS AG) 29 September 1999

D2: KRAL R ET AL: 'VERSUCHE MIT EINEM SENKRECHT
BEROHRTEN BENSON-VERDAMPFER IN EINEM 160-T/H-
DAMPFERZEUGER', VGB KRAFTWERKSTECHNIK, VGB
KRAFTWERKSTECHNIK GMBH. ESSEN, DE, Vol. 73,
No. 9, PAGE(S) 793-797 XP000396381 ISSN: 0372-
5715

D3: JUZI H ET AL: 'ZWANGDURCHLAUFKESSEL FUER
GLEITDRUCKBETRIEB MIT VERTIKALER
BRENNKAMMERBEROHRUNG', VGB KRAFTWERKTECHNIK, VGB
KRAFTWERKTECHNIK GMBH, ESSEN, DE, No. 4, PAGE(S)
292-302 XP002054983 ISSN: 0372-5715

D4: PATENT ABSTRACTS OF JAPAN Vol. 015, No. 505
(M-1194), 20 December 1991 (1991-12-20) &
JP 03 221702 A (TOSHIBA CORP), 30 September 1991

D5: US-A-6 019 070 (DUFFY THOMAS E) 1 February 2000

D6: DE 197 00 350 A (STEINMUELLER GMBH L & C)
16 July 1998

D7: DE 34 41 972 A (BELGORODSKIJ Z ENERGET MASH;
PROISVODSTVENNOE OB PROEKT NAL (SU)) 28 May 1986

D8: EP-A-0 450 072 (MIURA KOGYO KK) 9 October 1991

1. The present application meets the requirements of PCT Article 33(2) and (3) because the subject matter of independent method claim 1 is novel and involves an inventive step.

Document D1, which is regarded as the closest prior art, discloses a steam generator in which a steam generator tube that is heated to a greater degree has a higher throughflow of flow medium than a steam generator tube heated to a lesser degree.

The subject matter of claim 1 differs from the steam generator described in document D1 by virtue of the following two features:

- a. The steam generator consists of at least one vertical down tube through which medium flows in the downstream direction and of at least one downstream, vertical rising tube through which medium flows in the upstream direction.

The above feature can be considered to address the problem of producing a flow in the evaporator tubes that imitates natural circulation.

Documents D4 to D7 disclose steam generators with a down tube through which medium flows in the downstream direction and a rising tube through which medium flows in the upstream direction. This design for the evaporator has the advantage of producing a flow characteristic in the evaporator tubes that imitates natural circulation. However, this design for a steam generator such as disclosed in documents D4 to D7 has the problem that steam bubbles may form in the down tube when the steam generator is in use.

When steam bubbles form there is a chance that they may rise in the down tube contrary to the flow direction of the flow medium. In order to prevent this from happening, a person skilled in the art must ensure that the flow medium is fed to the down tube such that it has a flow speed that is greater than a predefined minimum speed. This, however, is the second feature by virtue of which the subject matter of claim 1 differs from the prior art (see point b). A person skilled in the art would not, therefore, apply this knowledge from documents D4 to D7 to the steam generator in document D1, since this would require further modifications to the steam generator.

- b. The flow medium is fed to the down tube such that it has a flow speed that is greater than a predefined minimum speed.

The above feature can be considered to address the problem of guaranteeing sufficient cooling in the evaporator tubes.

Documents D2 and D3 both disclose designs for an evaporator in which the requisite mass flow density in the tubes is minimum in order to ensure sufficient cooling. Those documents do not, however, disclose steam generators with a down tube and a rising tube.

A person skilled in the art could combine the knowledge from documents D2 and D3 with that from the closest prior art in order to solve the problem of sufficient cooling. This would not, however, lead to the subject matter of claim 1, which

discloses a steam generator with a down tube and a rising tube.

2. Claims 2 and 3 are dependent on claim 1 and therefore likewise meet the PCT requirements for novelty and inventive step.
3. The subject matter of independent claim 4 does not involve an inventive step (PCT Article 33(3)).

Document D1, which is regarded as the prior art closest to this claim also, discloses a steam generator with **two evaporator continuous heating panels (8 and 10) one behind the other**, a steam generator tube that is heated to a greater degree having a higher throughflow of flow medium than a steam generator tube heated to a lesser degree.

The subject matter of claim 4 differs from the steam generator described in document D1 by virtue of the following feature:

The steam generator consists of at least one vertical down tube through which medium flows in the downstream direction and of at least one downstream, vertical rising tube through which medium flows in the upstream direction.

The above feature can be considered to address the problem of producing a flow in the evaporator tubes that imitates natural circulation.

Documents D4 to D7 disclose steam generators with a down tube through which medium flows in the downstream direction and a rising tube through which

medium flows in the upstream direction. This design for the evaporator has the advantage of producing a flow characteristic in the evaporator tubes that imitates natural circulation. A person skilled in the art would combine the teaching from any of documents D4 to D7 with that of document D1 and thus arrive at the claimed steam generator without thereby being inventive.

It is also pointed out that claim 4 does not disclose any means for ensuring that the flow speed is greater than a predetermined minimum flow speed.

4. The subject matter of dependent claims 5 to 10 and 13 is also not inventive (PCT Article 33(3)) for the following reasons:

claim 5: the feature whereby different evaporator tubes are fed using a different mass flow rate is known from document D1. This keeps thermal loads on the evaporator tubes low;

claim 6: the feature of entraining the steam bubbles is a feature which a person skilled in the art would use without thereby being inventive;

claim 7: documents D7 and D8 disclose outlet collectors with a longitudinal axis that runs parallel to the direction of the heating gas, resulting in improved intermixing of the flow medium;

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claim 8: documents D7 and D8 both disclose tube racks which are formed from a number of steam generator tubes placed one next to the other;

claim 9: document D7 also discloses a plurality of horizontal outlet collectors which are placed one next to the other and are associated with the individual tube racks;

claim 10: it would not require inventive input to connect the horizontal outlet collector in document D7 with an associated inlet collector, even though this is not explicitly disclosed in D7;

claims 11 and 12: these features are only some of the obvious possibilities from which a person skilled in the art would choose according to the circumstances in order to solve the problem of interest, without thereby being inventive;

claim 13: to place a steam generator downstream of a gas turbine is a known procedure to a person skilled in the art.

5. Contrary to PCT Rule 5.1(a)(ii), the description does not cite documents D1 and D7 or indicate the relevant prior art disclosed therein.